



[7590-01P]

**NUCLEAR REGULATORY COMMISSION**

**[Docket No. 50-182; NRC-2011-0186]**

**Purdue University Reactor**

**AGENCY:** Nuclear Regulatory Commission.

**ACTION:** Environmental assessment and finding of no significant impact; issuance.

**SUMMARY:** The U.S. Nuclear Regulatory Commission (NRC) is considering renewal of Facility Operating License No. R-87, held by Purdue University (the applicant), for the continued operation of the Purdue University Reactor (PUR-1), located in West Lafayette, Tippecanoe County, Indiana for an additional 20 years. In connection with the renewed license, the applicant is also seeking a power increase from 1 kilowatt thermal (kW(t)) to a licensed power level of 12 kW(t). The NRC is issuing an environmental assessment (EA) and finding of no significant impact (FONSI) associated with the renewal of the license.

**DATES:** The EA and FONSI referenced in this document is available on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

**ADDRESSES:** Please refer to Docket ID **NRC-2011-0186** when contacting the NRC about the availability of information regarding this document. You may obtain publicly-available information related to this document using any of the following methods:

- **Federal Rulemaking Web Site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2011-0186**. Address questions about NRC dockets to Carol Gallagher;

telephone: 301-415-3463; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**

You may obtain publicly-available documents online in the ADAMS Public Documents collection at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search.](#)" For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr.resource@nrc.gov](mailto:pdr.resource@nrc.gov). For the convenience of the reader, the ADAMS accession numbers are provided in a table in the "Availability of Documents" section of this document.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

**FOR FURTHER INFORMATION CONTACT:** Cindy K. Montgomery, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3398; e-mail: [Cindy.Montgomery@nrc.gov](mailto:Cindy.Montgomery@nrc.gov).

## **SUPPLEMENTARY INFORMATION:**

### **I. Introduction**

The NRC is considering issuance of a renewed Facility Operating License No. R-87, held by Purdue University, which would authorize continued operation of PUR-1, located in West Lafayette, Tippecanoe County, Indiana, for an additional 20 years. In connection with the renewed license, the applicant is also seeking a power increase from 1 kW(t) to 12 kW(t). As required by section 51.21 of title 10 of the *Code of Federal Regulations* (10 CFR), "Criteria for and identification of licensing and regulatory actions requiring environmental assessments," the NRC performed an EA. Based on the results of the EA that follows, the NRC has determined not to prepare an environmental impact statement for the proposed action and is issuing a FONSI.

### **II. Environmental Assessment**

#### *Description of the Proposed Action*

The proposed action would renew Facility Operating License No. R-87 for a period of 20 years from the date of issuance of the renewed license. The proposed action would also authorize a power increase from 1 kW(t) to 12 kW(t). The proposed action is in accordance with Purdue University's application dated July 7, 2008, as supplemented by letters dated June 30, 2008; June 3, and June 4, 2010; November 15, 2011; January 4, January 30, January 31, June 1, June 15, June 29, July 13, and August 11, 2012; April 10, 2013; July 24, 2015; and January 29, February 26, March 31, May 9, July 7, July 19, September 19, and September 29, 2016 (collectively referred to as "the renewal application"). In accordance with

§ 2.109, “Effect of timely renewal application,” the existing license remains in effect until the NRC takes final action on the renewal application.

#### *Need for the Proposed Action*

The proposed action is needed to allow the continued operation of the PUR-1, which is used for teaching and research to support the mission of Purdue University, for a period of 20 years. Operation of the PUR-1 at the requested higher power level would expand the educational and research uses of the facility.

#### *Environmental Impacts of the Proposed Action*

Separate from the environmental assessment referenced in this document, the NRC is writing a safety evaluation (SE) of the proposed action to issue renewed Facility Operating License No. R-87 to allow continued operation of the PUR-1 for a period of 20 years. The details of the NRC’s SE will be provided with the renewed license, if approved. This document contains the EA of the proposed action.

The applicant has requested a power increase from 1 kW(t) to 12 kW(t) maximum allowed licensed power. The applicant performed analyses at 18 kW(t) to bound the requested power increase. The applicant’s required annual reports from 2011 through 2015 indicate that no measurable amount of radioactive effluent was released from the PUR-1 to the environment.

#### *Facility Site and Environs*

The PUR-1 is a heterogeneous, pool-type non-power reactor that has been in operation since 1962 for teaching and research purposes. The PUR-1 is located in the Duncan Annex of the Electrical Engineering Building on the eastern edge of the Purdue University campus. The building was originally designed as a high voltage laboratory, and the space was later converted

into classrooms, laboratories, and offices. The building is constructed of brick, concrete block, and reinforced concrete. Within the Duncan Annex, the PUR-1 is located within a 6,400-gallon cylindrical water tank that is 17 feet deep and 8 feet in diameter. The tank is enclosed by a concrete shielding structure.

The PUR-1 operates about 90 times per year on average. The reactor is fueled with standard low-enriched uranium plate-type fuel and is cooled by natural convection of light water. The reactor coolant system includes a process system, which controls the pool water temperature, and a purification system, which is designed to maintain pool water quality by limiting corrosion and coolant activation by the use of microfilters and ion exchange resins. Water from the pool is drawn out from the scupper drain or suction line via polyvinyl chloride piping leading to the circulating pump; a second source of water for the pump is a water supply tank supplied with city service water and controlled by a float valve. Ball valves for water shutoff and a vacuum cleaning connection are provided in the pump supply line. From the pump, a pipe with a ball valve installed leads first to the filter and then to a demineralizer. An adjustable by-pass or throttling valve is inserted in the system to regulate water flow through the demineralizer. A flow indicator and a conductivity indicator are installed as a check on flow rate and water purity from the demineralizer. The water next flows through a stainless steel heat exchanger. The water from the heat exchanger is then returned to the reactor pool. A magnetrol water-level control is located in the reactor pool; this unit controls a solenoid valve in the line from the water supply tank to ensure that the prescribed pool water level is maintained. However, this system is manually controlled by the PUR-1 staff to allow makeup water to be inventoried. Makeup pool water is provided by the city public water supply.

A detailed description of the reactor can be found in the PUR-1 Safety Analysis Report (SAR) submitted by the applicant with its renewal application.

## A. Radiological Impacts

### *Environmental Effects of Reactor Operations*

During normal operations at the PUR-1 facility, the two primary airborne sources of radiation are argon-41 (Ar-41) and nitrogen-16 (N-16). N-16 is produced when oxygen in the pool water is irradiated in the reactor core, and must then diffuse to the pool surface before it is released to the atmosphere. The applicant estimates that, due to its short half-life (about 7 seconds), any N-16 produced by the reactor at the bounding power level of 18 kW(t) would decay before reaching the surface of the pool. The primary source of Ar-41 at the PUR-1 is from irradiation of air containing argon dissolved in the reactor pool. At the current 1 kW(t) steady-state operation, effluent samples in the reactor room have not contained detectable traces of Ar-41. At the bounding power level of 18 kW(t), the applicant estimates that steady-state operation of the reactor would produce an equilibrium concentration of  $2.08 \times 10^{-7} \mu\text{Ci}/\text{cm}^3$  of Ar-41 in the exhaust air and the reactor room, which is lower than the  $3.0 \times 10^{-6} \mu\text{Ci}/\text{cm}^3$  Derived Air Concentration (DAC) limit for occupational workers found in 10 CFR part 20. Due to the DAC being below regulatory limits, the estimated occupational radioactivity exposure levels will also be below the 10 CFR part 20 limit of 5 reontgen equivalent man (rem). The estimated dose rate to a worker at the bounding power level of 18 kW(t) was calculated by the applicant to be 0.167 milli roentgen equivalent man per hour (mrem/hr) (0.00167 millisievert/hour (mSv/hr)). Using the calculated dose rate, the total effective dose equivalent to a worker in the reactor room for an entire year would be less than 334 mrem (3.34 mSv), assuming a hypothetical 2,000-hour steady state, full power operation, since the reactor license contains no restriction on operating hours. The reactor normally operates for much less than the assumed 8 hours per day and the conservatively calculated dose is still well below the 5,000-mrem (50 mSv) limit

established in § 20.1201, "Occupational dose limits for adults." The applicant also calculated, at the bounding 18 kW(t) power level, an environmental public dose rate from normal operations to a person in the unrestricted area due to Ar-41 released from the building ventilation opening. The release point is on the roof vent on the top of the building 15 meters above ground. Assuming a hypothetical continuous steady state, full power operation for a year, the applicant calculated the public dose rate to be  $3.17 \times 10^{-4}$  mrem/hr ( $3.17 \times 10^{-6}$  mSv/hr) or 2.8 mrem/yr (0.28 mSv/yr), which is well below the limit in § 20.1301 of 100 mrem/yr (1 mSv/yr). This calculated public dose rate would also meet the as low as is reasonably achievable (ALARA) dose constraint of 10 mrem/yr (0.1 mSv/yr) found in § 20.1101(d).

Purdue University has a structured radiation safety program. Policies for the program are determined by the University Radiation Safety Committee, which has the mission to ensure the safety of the University and community in the utilization of all radioactive materials and radiation-producing devices at the University by faculty, staff, or students. The program is administered by the Radiation Safety Officer and his staff, as part of Radiological and Environmental Management. The staff is equipped with radiation detection instrumentation to determine, control, and document occupational radiation exposures at the reactor facility under the broad scope byproduct materials license held by Purdue University.

Only very limited contaminated materials are generated by PUR-1. Any contaminated material is disposed of under the Purdue University broad scope license. No wastes have been released to the environment in an uncontrolled manner. During the past 5-year period from 2011 through 2015, the applicant reported no routine releases of liquid radioactive waste by any disposal method. The NRC assumes that any changes due to the requested power increase from 1 kW(t) to 12 kW(t) are expected to be minimal and capable of being handled by the existing systems and procedures.

As described in Chapter 11 of the PUR-1 SAR, personnel exposures are well within the limits set by § 20.1201, "Occupational dose limits for adults," and the ALARA dose criteria in § 20.1101(b). The University is committed to the principle of ALARA and it makes every effort to keep doses to a minimum. All unanticipated or unusual exposures are investigated. According to annual reports for the past 5 years of operation from 2011 through 2015, there were no radiation exposures greater than 25 percent of limits set forth in § 20.1201. The change in occupational dose from the proposed power uprate from 1 kW(t) to 12 kW(t) is discussed previously in this notice.

The applicant monitors dose to the public by placing thermoluminescent dosimeters (TLD) at the boundaries of the facility. The TLDs are checked for exposure every other month. Doses measured from the TLDs at the current operating power level of 1 kW(t) have been at background levels, therefore, the applicant concludes that the public has not received exposures greater than the limits set forth in § 20.1301, "Dose limits for individual members of the public." As stated previously, this should not change for the proposed power increase of 12 kW(t). Additionally, the potential radiation dose from current operations at 1kW(t) also demonstrates compliance with the ALARA dose constraints specified in § 20.1101(d), "Radiation protection programs." As stated previously, this should not change for the proposed power increase of 12 kW(t).

Over the past 5 years of operation from 2011 through 2015, results from the applicant's survey program indicate that radiation exposures at the current operating power level of 1 kW(t) at the monitoring locations were not significantly higher than those measured at the control locations. This should not change for the proposed power increase of 12 kW(t). Therefore, the NRC concludes that the proposed action would not have a significant radiological impact.



### *Environmental Effects of Accidents*

The maximum hypothetical accident (MHA) is an event involving the cladding failure of an irradiated fuel element in air. The MHA is considered the worst-case fuel failure scenario for PUR-1 that would lead to the maximum potential radiation hazard to facility personnel and to members of the public. The results of the MHA are used by the NRC to evaluate the ability of the applicant to respond and mitigate the consequences of this postulated radioactive release.

The applicant conservatively calculated doses to facility personnel during evacuation and the maximum potential doses to members of the public at various locations around the PUR-1 facility. The license estimated an occupational dose of 317 mrem (3.17 mSv), for a one minute (evacuation) duration, and 47 mrem (0.47 mSv) for the maximum exposed member of the public. The NRC performed independent calculations to verify that the applicant's calculated doses represented conservative estimates for the MHA. The NRC, using conservative assumptions, estimated a dose to a worker of 294 mrem (2.94 mSv) for a one minute duration, and 4 mrem (0.04 mSv) for the maximum exposed member of the public. The details of these calculations are provided in the NRC's SER that will be issued with the renewed license. The occupational radiation doses resulting from the postulated MHA would be well below the 10 CFR 20.1201 limit of 5,000 mrem (50 mSv). The maximum calculated radiation doses for members of the public resulting from the postulated MHA would be below the 10 CFR 20.1301 limit of 100 mrem (1 mSv).

Because the NRC concludes in the SE that the radiological consequences of the MHA are within the NRC's 10 CFR part 20 dose limits, the proposed action will not have a significant impact with respect to the radiological consequences of the MHA.

### *Conclusions – Radiological Impacts:*

As discussed previously in this notice, the applicant has requested a power increase from 1kW to 12 kW maximum allowed licensed power. In addition, as previously described, while there is a potential increase in routine occupational and public radiation exposure as a result of license renewal at the higher power level, all exposure rates and doses would be within regulatory limits. There would be no changes in the types of effluents that may be released off site, and any potential increase in their quantities would be within regulatory limits. The applicant has systems in place for controlling the release of radiological effluents and implements a radiation protection program to monitor personnel exposures and releases of radioactive effluents, and the systems and radiation protection program are appropriate for the types and quantities of effluents expected to be generated by continued operation of the reactor. The proposed action will not significantly increase the probability or consequences of accidents. Therefore, license renewal and the proposed power increase would not change the environmental impact of facility operation. The NRC evaluated information contained in the renewal application and data reported to the NRC by the applicant for the last 5 years of operation to determine the projected radiological impact of the facility on the environment during the period of the renewed license. The NRC found that releases of radioactive material and personnel exposures were all well within applicable regulatory limits. Based on this evaluation, the NRC concludes that the proposed action would not have a significant environmental impact.

### **B. Non-Radiological Impacts**

The proposed action would not result in any land use changes, visual resource impacts, or increases in noise. No significant changes in air emissions would occur as a result of the proposed license renewal and power increase. Because water is supplied through the city, the

proposed action would not affect surface water or groundwater resources. There is no potential for the proposed action to affect aquatic or terrestrial resources. Therefore, the NRC concludes that the proposed action would have no significant non-radiological impacts.

#### *Other Applicable Environmental Laws*

In addition to the National Environmental Policy Act (NEPA), the NRC has responsibilities that are derived from other environmental laws, which include the Endangered Species Act (ESA), Coastal Zone Management Act, National Historic Preservation Act (NHPA), Fish and Wildlife Coordination Act, and Executive Order 12898 Environmental Justice. Preparing this EA satisfies the agency's obligations under NEPA. The following presents a brief discussion of impacts associated with resources protected by these laws.

#### Endangered Species Act

The NRC staff conducted a search of Federally listed species and critical habitats that have the potential to occur in the vicinity of the PUR-1 using the U.S. Fish and Wildlife Service's (FWS) Environmental Conservation Online System Information for Planning and Conservation (IPaC) system. Five Federally-listed mussels—clubshell (*Pleurobema clava*), fanshell (*Cyprogenia stegaria*), snuffbox (*Epioblasma triquetra*), rabbitsfoot (*Quadrula cylindrical cylindrical*), and sheepnose (*Plethobasus cyphus*)—and the Indiana bat (*Myotis sodalis*) occur in Tippecanoe County. However, none of these species are likely to occur near the PUR-1 because the facility is located on the Purdue University Campus, which has been developed since the 1960s and does not provide suitable habitat for Federally-listed species. Additionally, operation of PUR-1 has no direct nexus to the natural environment that would affect Federally-listed species. Accordingly, the NRC concludes that the proposed license renewal of the PUR-1 would have no effect on Federally-listed species or critical habitats. Federal agencies are not required to consult with the FWS if they determine that an action will not affect

listed species or critical habitats (ADAMS Accession No. ML16120A505). Thus, the ESA does not require consultation for the proposed PUR-1 license renewal and proposed power uprate, and the NRC considers its obligations under ESA section 7 to be fulfilled for the proposed action.

#### Costal Zone Management Act

Tippecanoe County, Indiana does not contain any coastal zones. Because the PUR-1 is not located within or near any managed coastal zones, the proposed action would not affect any coastal zones and Coastal Zone Management Act consistency certification does not apply.

#### National Historic Preservation Act

The NHPA requires Federal agencies to consider the effects of their undertakings on historic properties. As stated in the Act, historic properties are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP). The NRHP lists several historic districts and properties within 0.5 miles of PUR-1 in the Duncan Annex of the Electrical Engineering Building on the campus of Purdue University. Operation of PUR-1 has not likely had any impact on these districts and properties. Based on this information, the NRC staff finds that the potential impacts of license renewal and the continued operation of PUR-1 would have no adverse effect on historic properties located near PUR-1.

#### Fish and Wildlife Coordination Act

The proposed action does not involve any water resource development projects, including any of the modifications relating to impounding a body of water, damming, diverting a stream or river, deepening a channel, irrigation, or altering a body of water for navigation or drainage. Therefore, no coordination with FWS pursuant to the Fish and Wildlife Coordination Act is required for the proposed action.

## Executive Order 12898 – Environmental Justice

The environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from the relicensing and the continued operation of PUR-1. Such effects may include human health, biological, cultural, economic, or social impacts.

Minority Populations in the Vicinity of PUR-1. According to U.S. Census Bureau's 2010 Census, approximately 21 percent of the total population (approximately 164,000 individuals) residing within a 10-mile radius of PUR-1 identified themselves as minorities. The largest minority population were Hispanic, Latino, or Spanish origin of any race at (approximately 12,800 or 8 percent), followed by Asian (approximately 10,700 persons or 7 percent). According to the 2010 Census, about 20 percent of the Tippecanoe County population identified themselves as minorities, with persons of Hispanic, Latino, or Spanish origin and Asians comprising the largest minority populations (approximately 8 and 7 percent, respectively). According to the U.S. Census Bureau's 2014 American Community Survey 1-year Estimates, the minority population of Tippecanoe County, as a percent of the total population, had increased to about 22 percent.

Low-income Populations in the Vicinity of PUR-1. According to the U.S. Census Bureau's 2010–2014 American Community Survey 5-Year Estimates, approximately 36,000 persons and 4,000 families (approximately 22.7 and 11.7 percent, respectively) residing within a 10-mile radius of PUR-1 were identified as living below the Federal poverty threshold. The 2014 Federal poverty threshold was \$24,230 for a family of four.

According to the U.S. Census Bureau's 2014 American Community Survey Census 1-Year Estimates, the median household income for Indiana was \$49,446, while 11 percent of families and 15.2 percent of the state population were found to be living below the Federal

poverty threshold. Tippecanoe County had a lower median household income average (\$45,771) and a higher percent of families and people living below the poverty level (12.2 and 23.6 percent, respectively).

Impact Analysis. Potential impacts to minority and low-income populations would mostly consist of radiological effects, however, radiation doses from continued operations associated with the license renewal and the proposed power increase are expected to continue at current levels, and would be well below regulatory limits.

Based on this information and the analysis of human health and environmental impacts presented in this EA, the proposed action would not have disproportionately high and adverse human health and environmental effects on minority and low-income populations residing in the vicinity of PUR-1.

#### *Environmental Impacts of the Alternatives to the Proposed Action:*

As an alternative to license renewal, the NRC considered denying the proposed action (i.e., the “no-action” alternative). If the NRC denied the request for license renewal, reactor operations would cease and decommissioning would be required. The NRC notes that, even with a renewed license, PUR-1 will eventually be decommissioned, at which time the environmental effects of decommissioning would occur. Decommissioning would be conducted in accordance with an NRC-approved decommissioning plan, which would require a separate environmental review under § 51.21. Cessation of reactor operations would reduce or eliminate radioactive effluents. However, as previously discussed in this EA, radioactive effluents from reactor operations constitute a small fraction of the applicable regulatory limits. Therefore, the environmental impacts of license renewal, including the proposed power uprate, and the denial of the request for license renewal would be similar. In addition, denying the request for license

renewal would eliminate the benefits of teaching, research, and services provided by the PUR-1 facility.

*Alternative Use of Resources:*

The proposed action does not involve the use of any different resources or significant quantities of resources beyond those previously considered in the issuance of Facility Operating License No. R-87 for the PUR-1 in August 1988, which renewed the Facility Operating License for a period of 20 years.

*Agencies and Persons Consulted:*

The NRC did not enter into consultation with any other Federal agencies or with the State of Indiana regarding the environmental impact of the proposed action. However, on October 21, 2016, the NRC notified the Indiana State official, Ms. Laura Dresen, Radiation Programs Director, of the Indiana Department of Homeland Security of the proposed action. The State official had no comments.

### **III. Finding of No Significant Impact**

The NRC is considering issuance of a renewed Facility Operating License No. R-87, held by Purdue University, which would authorize the continued operation of PUR-1 for an additional 20 years.

On the basis of the EA included in Section II of this notice and incorporated by reference in this finding, the NRC concludes that the proposed action would not have significant effects on the quality of the human environment. Section IV lists the environmental documents related to the proposed action and includes information on the availability of these documents. Based on

its findings, the NRC has decided not to prepare an environmental impact statement for the proposed action.

#### IV. Availability of Documents

The documents identified in the following tables are available to interested persons as indicated.

Document	ADAMS Accession No.
Purdue University, School of Nuclear Engineering. Application for relicense of License Number R-87 with Power Uprate, July 7, 2008	ML083040443
Purdue University Safety Analysis Report, June 30, 2008 [Redacted Version]	ML111890201
Purdue University - Request for Additional Information (RAI) Regarding License Renewal, [Decommissioning Funding Statement of Intent], June 3, 2010	ML101620125
Purdue University - Request For Additional Information Regarding the Purdue University Reactor License Renewal (Tac No. Me 1594), Responses to RAIs Dated 24 March 2010, [Responses To ML100820019, financial assurance, statement of intent, signature authority, financial report], June 4, 2010	ML101620184
Response to Request for Additional Information Regarding the Purdue University Reactor License Renewal (TAC ME1594), Response to RAIs Dated 6 July 2011 (ML101460429), November 15, 2011	ML11320A287
Purdue University - Request for Additional Information Regarding the License Renewal, Responses to RAIs Dated 6 July 2011, [Responses 11, 12, 13, 15, 16, 18, 21, 23, 25, 27, 28, 30, 31, 33, 35, 36, and 37], January 4, 2012	ML12006A193
Purdue University - Responses to the Request for Additional Information Regarding the Purdue University Reactor License Renewal dated July 6, 2011, [Responses 3, 4, 7, 10, 17, 19, 20, 22, 24, 29, 34, and 40], January 30, 2012	ML12031A223
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal (TAC NO. ME 1594), Responses to RAIs (ML103400115 and ML103400250) (Redacted Version), [Responses 45, 55, 62, 65, 66, 67, 68, 70, and 73], January 31, 2012	ML14234A109
Request for Additional Information Regarding the Purdue University Reactor License Renewal (TAC ME1594), Responses to RAIs (ML103400115 and ML103400250), [Responses 43, 51, 56, 60, and 61], June 1, 2012	ML12156A364
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal (TAC No. ME1594), Responses to RAIs (ML103400115 and ML103400250), [Response 46, 47, 52, 57, and 59], June 15, 2012	ML12170B018
Purdue University - Request for Additional Information Regarding the Purdue	ML12170B018



University Reactor License Renewal, Responses to RAIs (ML103400115 and ML103400250), [Response 48, 58, 96, 97 and 98], June 29, 2012	
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal, Response to RAI, [Response 49, 50, 53, 64, and 72], July 13, 2012	ML12201A070
Purdue University - Response to Request for Additional Information Regarding Purdue University Reactor License Renewal (TAC No. ME1594, Responses to RAIs (ML103400115 and ML103400250), [Responses 54, 69, 77, 78, and 92], August 11, 2012	ML12226A400
Purdue University - Response to Request Request for Additional Information Regarding the Purdue University Reactor License Renewal (TAC ME1594), [Responses 54, 69, 77, 78, and 92], April 10, 2013	ML13101A044
U.S. Fish and Wildlife Service, Endangered Species Consultations Frequently Asked Questions, July 15, 2013	ML16120A505
Purdue University Research Reactor, Report on Reactor Operations For the Period January 1, 2011 to December 31, 2011, July 18, 2013	ML13203A081
Purdue University Research Reactor, Report on Reactor Operations For the Period January 1, 2012 to December 31, 2012, July 18, 2013	ML13203A082
Purdue University Research Reactor, Report on Reactor Operations For the Period January 1, 2013 to December 31, 2013, May 22, 2014	ML14154A123
Purdue University Research Reactor, Report on Reactor Operations For the Period January 1, 2014 to December 31, 2014, March 30, 2015	ML15092A160
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal Application (TAC No. ME1594), Responses to Letter Dated August 29, 2014 (ML14115A221), [RAI cover letter for responses to August 29, 2015 NRC letter], July 24, 2015	ML15210A280
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal Application (TAC No. ME1594), Responses to Letter Dated August 29, 2014 (ML14115A221), Part 1 of 5, [RAI Responses part 1 of 5: responses (1-29), TS (30-64), d/c cost estimate (65-68), Requal (69-73), SAR Chs. 1-5 (70-162)], July 24, 2015	ML15210A282
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal Application (TAC No. ME1594), Responses to Letter Dated August 29, 2014 (ML14115A221), Part 2 of 5, [RAI Responses part 2 of 5 (SAR Chs. 6-15)], July 24, 2015	ML15210A283
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal Application (TAC No. ME1594), Responses to Letter Dated August 29, 2014 (ML14115A221), Part 3 of 5, [RAI Responses Part 3 of 5 (drawings)], July 24, 2015	ML15210A285
Purdue University - Request for Additional Information Regarding the Purdue University Reactor License Renewal Application (TAC No. ME1594), Responses to Letter Dated August 29, 2014 (ML14115A221), Part 4 of 5, [RAI Responses Part 4 of 5 (drawings)], July 24, 2015	ML15210A287
Purdue University - Request for Additional Information Regarding the Purdue	ML15210A288

University Reactor License Renewal Application (TAC No. ME1594), Responses to Letter Dated August 29, 2014 (ML14115A221), Part 5 of 5, [RAI Responses part 5 of 5 (NATCON, Procedures, Drawings)], July 24, 2015	
Purdue University - Response to NRC Request for Additional Information Regarding Physical Security Plan Review for License Renewal, January 29, 2016	ML16047A382
Purdue University - Re-Submittal Response to NRC Request for Additional Information Regarding Physical Security Plan Review for License Renewal, February 26, 2016	ML16083A219
Purdue Re-Submittal of Response to NRC Request for Additional Information Re: Physical Security Plan Review for License Renewal, March 31, 2016	ML16102A123
Purdue University Research Reactor, Report on Reactor Operations For the Period January 1, 2015 to December 31, 2015, March 31, 2016	ML16102A119
Purdue University - Second Re-Submittal of Response to NRC Request for Additional Information Regarding Physical Security Plan Review for License Renewal, May 9, 2016	ML16134A143

Purdue University School of Nuclear Engineering Notice of ADAMS Document Correction, PUR-1, Docket 50-182, ML16187A371, Technical Specifications, Proposed Amendment 13 Enclosed, [Correction of the TSs, originally submitted under ML16187A371], July 7, 2016	ML16193A681
Purdue University Responses to Request for Additional Information re PUR-1 License Renewal and Power Uprate, [Responses to RAIs ML15328A314], July 19, 2016	ML16207A426
Purdue University - Response to Request for Additional Information Regarding the Reactor License Renewal Application, Responses to Letter dated July 25, 2016, September 19, 2016	ML16267A465
Purdue University – Explanation of Technical Specification Changes and Emergency Operator Action, September 29, 2016	ML16277A165

Dated at Rockville, Maryland, this 21<sup>st</sup> day October, 2016.

For the Nuclear Regulatory Commission.

Alexander Adams, Jr., Chief,  
Research and Test Reactors Branch,  
Division of Policy and Rulemaking,  
Office of Nuclear Reactor Regulation.

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